Centre Number	Candidate Number

Candidate Name ______________________________

International General Certificate of Secondary Education

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

PHYSICS 0625/6

PAPER 6 Alternative to Practical

MAY/JUNE SESSION 2001 1 hour

Candidates answer on the question paper.
No additional materials required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
You may use a calculator.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
TOTAL	

This question paper consists of 12 printed pages.

SB (ND/CG) QF10313/2

1 (a) Fig. 1.1 shows the apparatus used for an experiment to investigate the extension of a steel spring. The laboratory bench to which the pulley and support for the spring are firmly fixed is not shown.

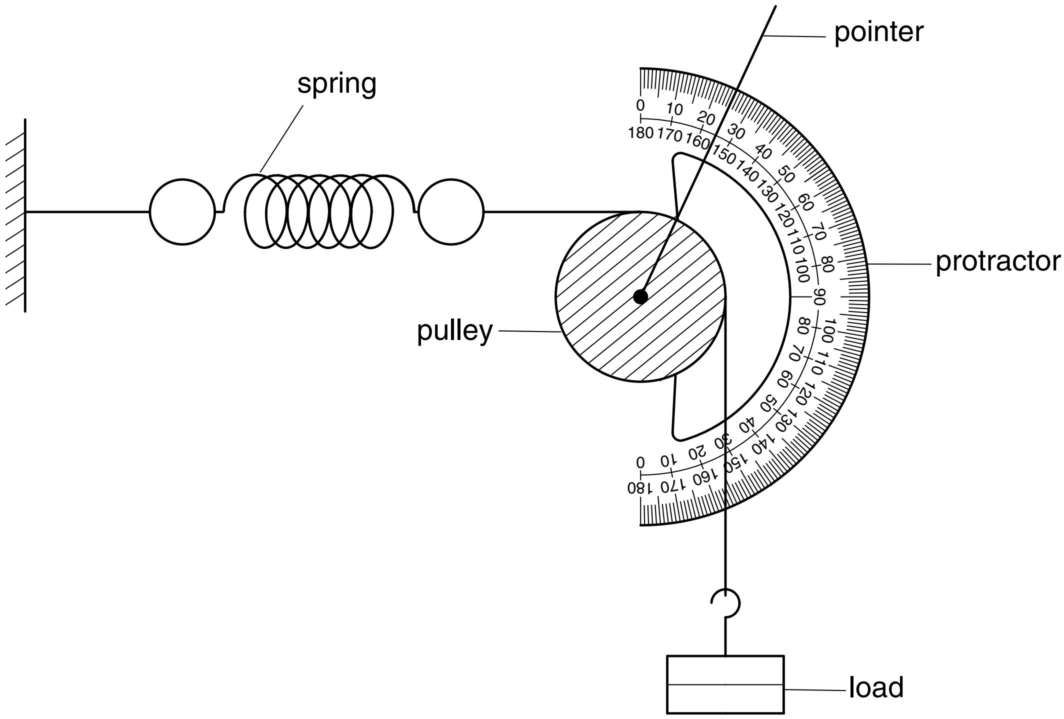

Fig. 1.1

The load is attached to the spring by a length of thread which passes over a pulley. The protractor is fixed in position. It is assumed that the angle through which the pointer moves when the load is increased is proportional to the extension of the spring.

A student recorded the angle θ through which the pointer moved for a range of loads, L, as shown in the table.

L / N	θ / °
0	0
1	3
2	14
3	27
4	43
5	57

(i) Plot the graph of θ/ ° (y-axis) against L / N (x-axis).

Draw the best fit straight line for loads from 1 N to 5 N. [6]

(ii) The student expected the graph to show a straight line through the origin. Suggest a reason why the results were not as expected.

....

....[1]

(b) Another student obtained results using the apparatus set up as shown in Figs. 1.2 and 1.3 which show the spring unloaded and the spring with a load of 1 N.

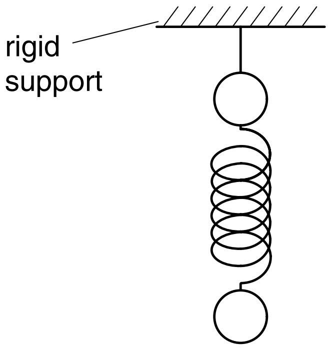

Fig. 1.2

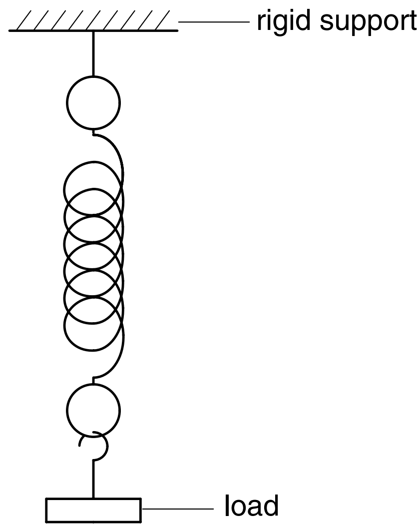

Fig. 1.3

(i) On Fig. 1.2, show clearly l_o, the length of the unloaded spring.

(ii) On Fig. 1.3, show clearly l_1, the corresponding length of the spring with a load of 1 N.

(iii) Write down the equation you would use to calculate *e*, the extension produced by adding the 1 N load.

e =........................

[2]

2 Some students were asked to carry out a simple experiment to compare different heat insulation materials.

(a) One student measured the temperature of hot water in insulated beakers (all the same size), waited for 5 minutes for the water to cool and then measured the temperatures again. Fig. 2.1 shows how one student recorded the results.

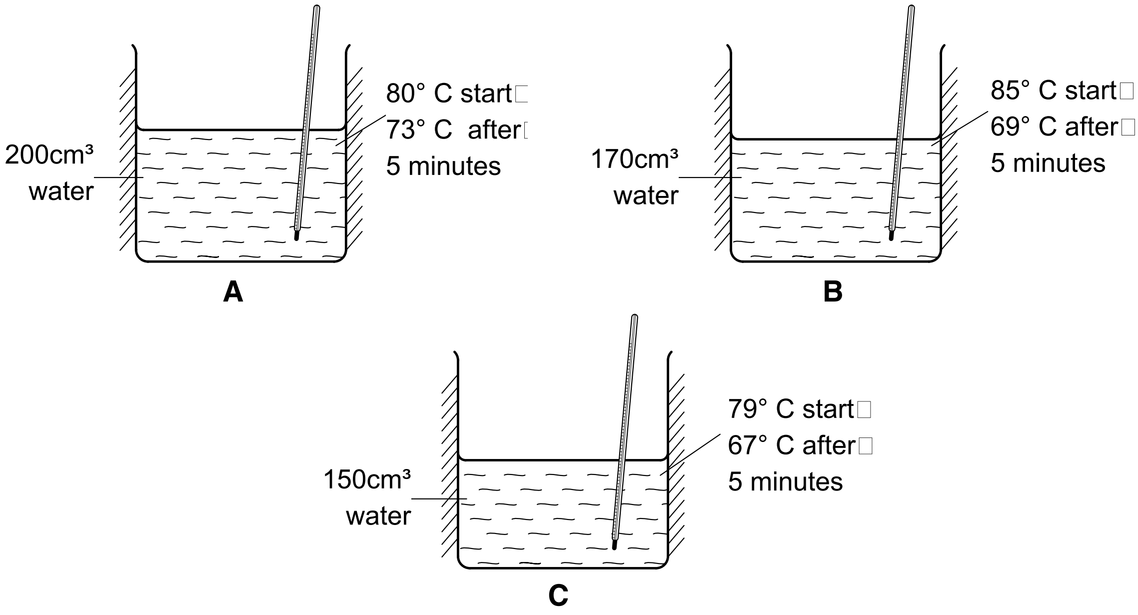

Fig. 2.1

(i) Calculate the temperature fall for each beaker.

beaker **A** ....

beaker **B** ....

beaker **C** ....

If you had **only** these results and no information about the way these results had been obtained, which beaker would **appear** to be the best insulated?

....

(ii) Suggest a simple, practical way to overcome the problem of heat loss, by evaporation and convection, from the surface of the water in the beaker.

....

(iii) Look at Fig. 2.1 again. Suggest **one** further improvement that you would make to improve the reliability of the experiment.

....

....

[5]

(b) Another student carried out a similar experiment, with proper control of the variables, and took temperature readings every 4 minutes. Room temperature during the experiment was 19 °C. He plotted a graph of temperature against time to show the cooling of the water in each beaker. Fig. 2.2 shows the graph obtained.

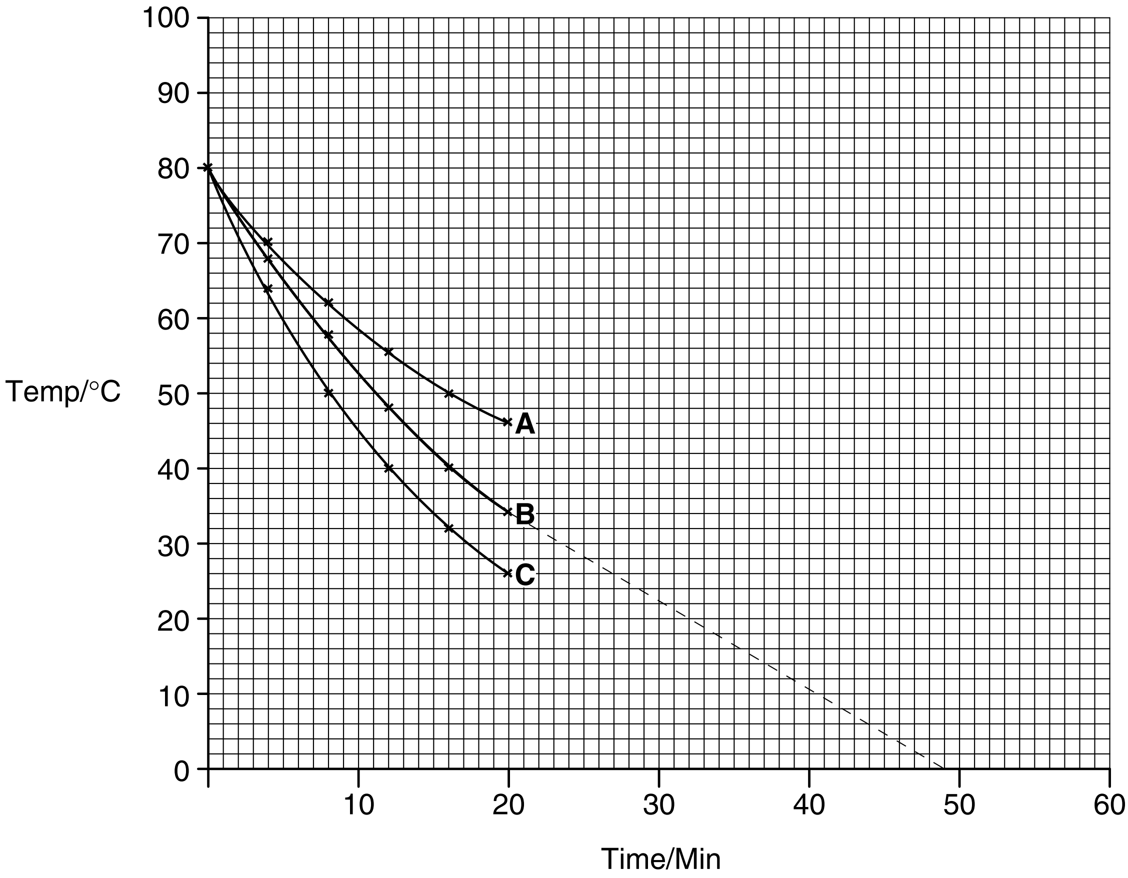

Fig. 2.2

(i) From the graph, which beaker, **A**, **B** or **C**, was best insulated ? ....

(ii) The student extended graph line **B** with a dotted line as shown. Explain why this does **not** show a realistic continuation of the cooling of the water.

....

(iii) On the graph, extend line **A** to show a realistic result up to 60 minutes.

[3]

3 Fig. 3.1 shows a circuit in which three resistors are connected to a d.c. power supply.

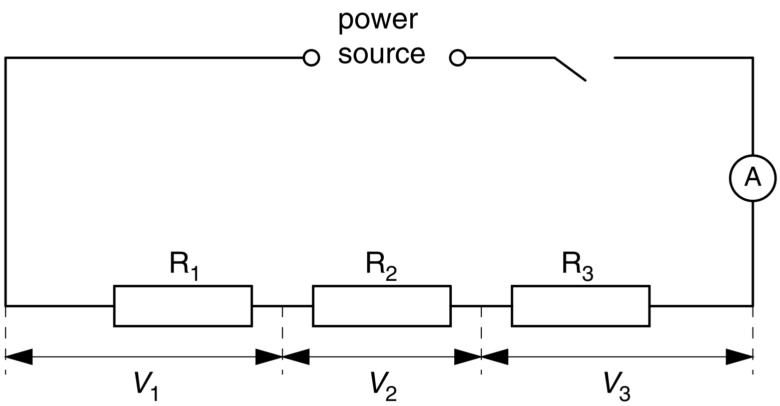

Fig. 3.1

A 0-1 V voltmeter was used to measure the potential differences V_1, V_2 and V_3.

Fig. 3.2 represents the face of the voltmeter when reading these values.

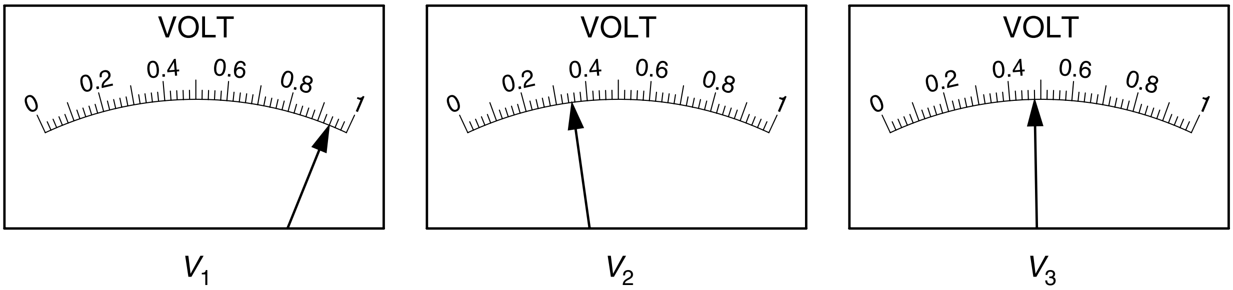

Fig. 3.2

(a) (i) Record the reading of each potential difference, shown in Fig. 3.2, in the table below.

potential difference	*V*/V
V_1	
V_2	
V_3	

(ii) Using the values in your table, predict the voltmeter reading when a 0-5 V voltmeter is connected across all three resistors together.

potential difference = ...

[5]

[Turn over

(iii) The current, I, in the circuit is 0.35 A. Using the values in your table and the equation $R = V/I$, calculate the resistances R_1, R_2 and R_3

R_1 = ...

R_2 = ...

R_3 = ...

[2]

(b) In the space below, draw a circuit diagram showing the same components as in Fig. 3.1 but with

- the three resistors in parallel,
- a voltmeter connected to record the potential difference across all three resistors
- the ammeter connected to record the current through R_1 only.

[3]

4 Fig. 4.1 shows the apparatus used to determine the maximum temperature rise of cold water when a hot glass stopper is transferred to the cold water.

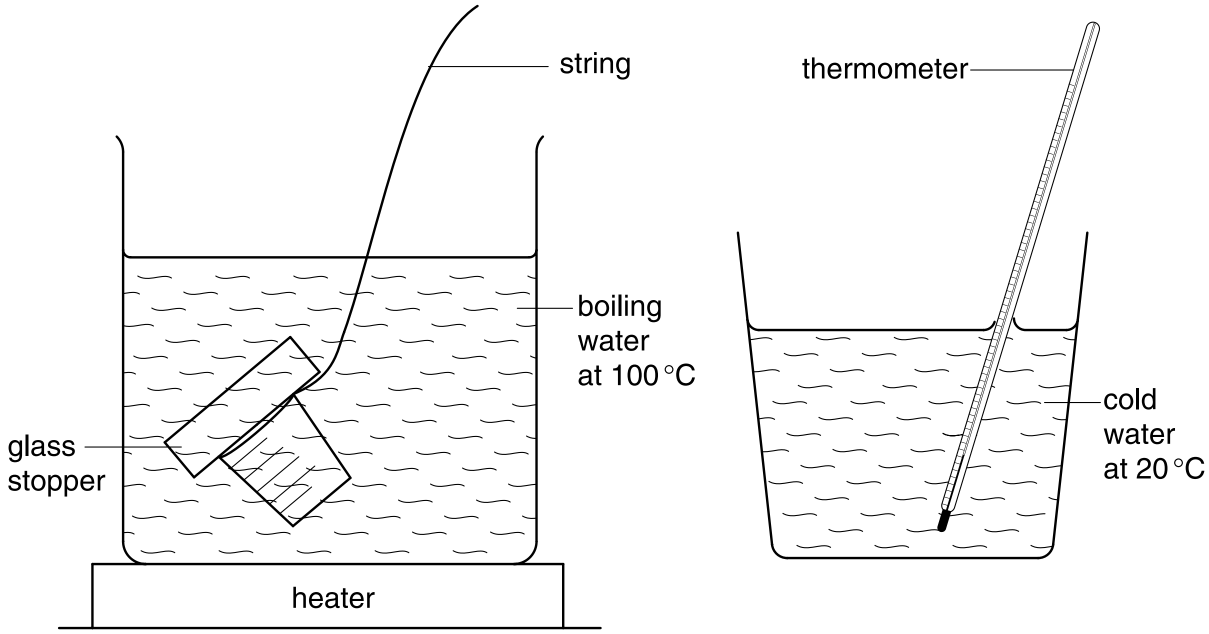

Fig. 4.1

(a) On Fig. 4.2, draw the mercury thread of the thermometer when it shows the temperature of the cold water in the plastic cup shown in Fig. 4.1.

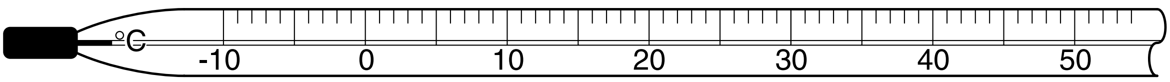

Fig. 4.2

[1]

(b) The glass stopper was heated for a long time in the boiling water. Suggest a reason for this.

....[1]

(c) Give **one** reason why the glass stopper should be transferred **quickly** from the boiling water to the cold water.

....[1]

(d) The maximum temperature that the cold water reached after the hot glass stopper was transferred to the cold water was 30.5 °C.

Calculate

(i) the temperature rise of the cold water,

....

(ii) the temperature fall of the glass stopper.

....
[2]

(e) When the experiment is repeated with a larger glass stopper, the temperature rise of the cold water was greater than with the smaller glass stopper. Why was this?

....[1]

5 Fig. 5.1 shows an illuminated object, a lens and a screen set up for an experiment to investigate the size of the image produced by the lens. The lens is mounted on a rectangular wooden block.

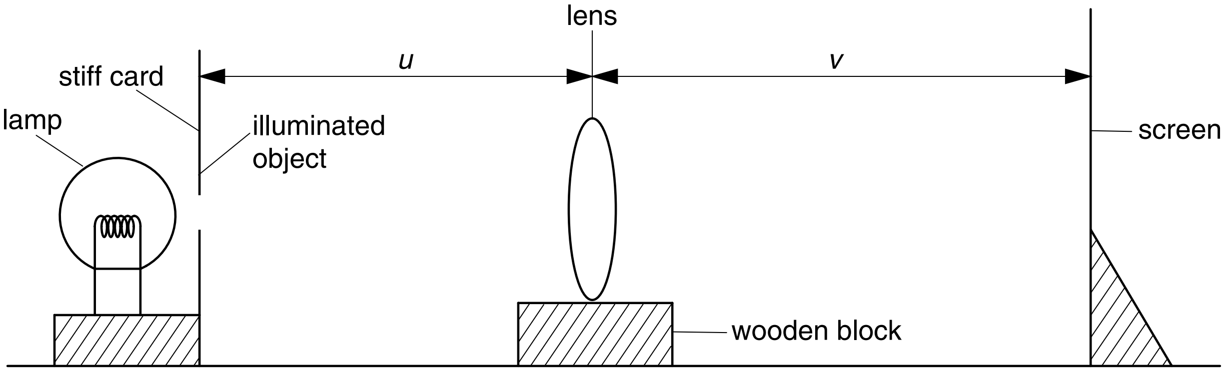

Fig. 5.1

Fig. 5.2 shows the shape and height (x cm) of the object.

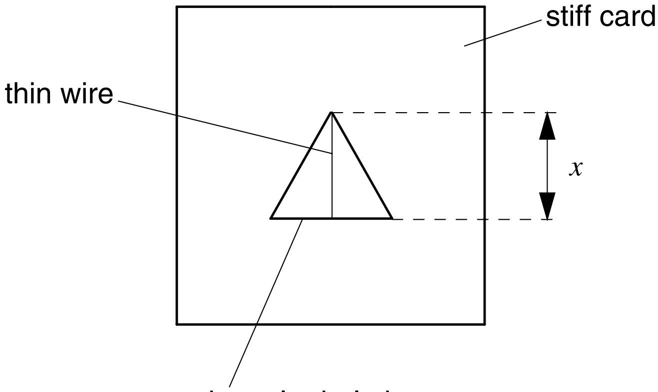

Fig. 5.2

(a) A student carried out the experiment, keeping the lens in the same position throughout. He set the object at a distance u = 15.0 cm from the centre of the lens, moved the screen until the image was sharply focused and then measured v, the distance from the centre of the lens to the screen. Finally, he measured y, the height of the image on the screen. He repeated the procedure using different values of u. The table below shows the readings he obtained.

u / cm	v / cm	x / cm	y / cm	y / cm (by calculation)
15.0	30.0	1.5	2.9	
20.0	19.6	1.5	1.6	
25.0	16.8	1.5	1.1	

[Turn over

The height of the image can be found by calculation, using the equation below.

$$y = \frac{v \times x}{u}$$

Calculate the *y* values in this way and enter them in the table, giving the values to an appropriate number of significant figures for comparison with the measured values. [2]

(b) Describe how you would measure as accurately as possible from the **centre** of the lens to the screen. You may draw a diagram and assume that a metre rule is available and other simple laboratory apparatus (e.g. set square and fine line marker pen).

....

....

....[2]

(c) In Fig. 5.3 below, draw a full-size diagram of the image formed on the screen when u = 15.0 cm. (Use the student's measured value, **not** the calculated value.)

[2]

Fig. 5.3

(d) State **one** precaution you would take when setting up the apparatus in order to obtain a clear image on the screen.

....

....

....[1]